TEAM LEARNING MODEL; A CRITICAL ENABLER FOR DEVELOPMENT OF EFFECTIVE AND EFFICIENT LEARNING ENVIRONMENTS

James Brewer
NOVONICS Corp.
Arlington VA 22202

Victoria Baldwin-King
Wiliamstown Technical Services
Newport Victoria 3015, Australia

Drew Beasley
DB & Associates LLC
Purcellville, VA 20132

Mike O'Neal
Naval Sea Sys. Command
Washington, D.C. 20376

ABSTRACT

With the on-rush of the information age and ready access to "faster, smaller and cheaper" devices, there has been a tendency for defense acquisition programs to chase the technology dragon. As a result of developing technology for technology's sake, training systems, for example, have been developed that neither met the need nor the user's expectations. These systems failed to create an effective/efficient team-learning environment. Up-front development of appropriate learning models would provide the acquisition process with a valuable framework to ensure technology met the needs of the trainee. A learning model is necessary for the development, evaluation, and appropriate technology upgrades through out the life cycle of a training system.

The Battle Force Tactical Training (BFTT) system was perhaps the first acquisition programs to develop an up-front "team learning model." This served as a framework in the development phase for the system design, M&S application, technology infusion and evaluation. Based on this learning model, the BFTT requirements incorporated not only technology capabilities but concepts of team facilitation, contextual immersion, collective critical thinking (problem solving), non-intrusive, data collection, relevant & timely after action review and reflective learning supported by active team dialogue as well. The learning model has served as a valuable aid in raising the Naval Joint and Coalition community awareness regarding the learning process dynamics and how it can enhance the readiness profile of forces preparing to go in harm's way. Discussions of the educational, industry and business communities indicate that the BFTT learning model has broader applications and can serve as a valuable function in stimulating dialogue and cooperative learning efforts in a number of venues.

AUTHORS' BIOGRAPHIES

Mr. James Brewer is currently employed by NOVONICS Corporation as a senior engineer and serves as the international Coalition Readiness Management System (CREAMS) Project Lead Engineer. Mr. Brewer graduated from California Polytechnic University, San Louis Obispo (BSEE), and the University of Southern California (MSSM). He served 30 years with US Naval Surface Warfare Center, Port Hueneme Division, holding key engineering and management positions spanning Combat Systems through Joint Operations including serving as the BFTT Technical Direction Agent.

Ms. Victoria Baldwin-King is currently a member of the Training Solutions Group with Williamstown Technical Services in Australia. Ms. Baldwin-King graduated from Frankston State College and the Royal Melbourne Institute of Technology (MS). She has 20 years experience in the education and industry sectors as a teacher, principal and consultant in the development of learning and training solutions. Currently, she is doing international research, which examines learning from an individual perspective and the benefits to the company using the learning organization model.

Mr. Drew Beasley is the PMS430 International Team, CREAMS Project Manager. He graduated from the United States Naval Academy (BS); Industrial College of the Armed Forces; and George Washington University (MS), and recently retired as a Captain, U. S Navy with extensive operational and programmatic experience including Program Manager for the Joint Simulation System (JSIMS) and Battle Force Tactical Training (BFTT) System.

Mr. Mike O'Neal is the Program Manager for the Navy's Performance Monitoring, Training and Assessment Program Office, PMS430, which includes the Battle Force Tactical Training System. A graduate of Miami University (BS), The George Washington University (MS), Indiana University (MS), has predominately served in combat systems and training related programs at the Naval Sea Systems Command.

TEAM LEARNING MODEL; A CRITICAL ENABLER FOR DEVELOPMENT OF EFFECTIVE AND EFFICIENT LEARNING ENVIRONMENTS

James Brewer
NOVONICS Corp.
Arlington VA

Victoria Baldwin-King
Wiliamstown Technical Services
Newport Victoria, Australia

Drew Beasley
DB & Associates LLC
Purcellville, VA

Mike O'Neal
Naval Sea Sys. Command
Washington, D.C.

"Are we Ready?" A proverbial question asked by all responsible leaders entrusted with taking a nation's most valuable asset, their young men and women, going into harm's way. Providing the answer to this crucial question raises its own dilemma: How do we know that the given answer is valid? ***How do we know what we know?***

Long before the Battle of Trafalgar, Vice Admiral Nelson faced this question. Nelson knew that the battlespace was NOT the place to address the question of readiness. To test his new tactics, Nelson ran many exercises in which his ships practiced mission relevant vignettes and measured performance down to the time cannon crews took to reload and fire the guns. After each exercise, Nelson would bring his Staff and ship Captains together aboard the flagship. This team would review in detail what had happened and discuss how to improve performance [1]. In affect, Nelson and his Commanders answered the question of "how did they know what they 'know'" by demonstrating what they knew within a mission relevant environment followed by reflective team dialogue. Nelson's learning strategy was validated by his remarkable victories at the Nile (Figure 1) and Trafalgar.

Figure 1. Not the time to ask, "Are we ready?"

In the 21st Century, Network Centric Warfare Commanders face the same question. They must forge effective coalition teams and conduct integrated operations in the fog of war where the asymmetric enemy is hard to define and the mission is highly dynamic [2]. In this dynamic future, ".. advantage come(s) from our leaders, people, doctrine, organizations and training that enable (the warfighter) to take advantage of technology to achieve superior warfighting effectiveness" (Joint Vision 2020) [3]. The challenge that faces the community at large is to provide the warfighter with an effective training capability that addresses the 21st Century Battlespace and beyond; so they are able to give an unqualified, "**YES**!" to the question, "Are we ready?

BACKGROUND

The Information Age is upon us; where change is the only constant. We know that we cannot stop '*change*' nor should we want to but we need to recognize how individuals and groups react to '*change'*. As a culture, including the military sector, we must face this "change" situation and provide individuals and teams with the appropriate tools to excel within this environment characterized by uncertainty and ambiguities [4]. The information age that caused the situation also holds the opportunity for viable solutions. Today, technology is exceeding all expectations with computer power doubling with ever-narrowing intervals. This provides a diverse set of options not available in the past. The challenge is selecting the appropriate technology to address the specific situation and achieve an effective outcome.

In 1990, based on observed Fleet performance and economic realities, the U.S. Navy published the Tactical Training Strategy and changed the focus of naval training. The traditional school house approach, supplemented by coaching during live exercises, was changed to a "deckplate" strategy where operators and teams train on their operational equipment, supported by on-board model and simulation (M&S) equipment [5]. Supporting studies determined that the most effective methodology for combat system teams to develop task and team skills was to learn as a team to solve meaningful problems (critical thinking) within a contextual environment ("learn like they fight") [6][7]. The Battle Force Tactical Training (BFTT) system was selected to implement the new naval Training Strategy [8].

Supporting the Chief of Naval Operations directive, the NAVSEA (PMS 430) BFTT Program Office took a new approach to the acquisition process. The acquisition process was streamlined and the PMS430 team included representation from the technical, cognitive and Navy user communities. Early on, it was decided that team learning requirements would drive the BFTT system development and these requirements would be captured in conceptual and process oriented team-learning models [9].

Over the last five years, the BFTT community participated in several Joint initiatives that resulted in shared cross-service learning models and methodologies [10]. Additionally, coalition partners are being invited to share in these concepts and tools under the U.S. Congressionally sponsored the Coalition Readiness Management System (CReaMS) project. [11]

FUNDAMENTAL REQUIREMENTS

The BFTT Conceptual Learning Model, here after referred to as the *conceptual learning model*, integrates concepts and premises from the industry, educational, and research communities. These elements are merged with operational projections and lessons learned to form a set of fundamental learning requirements. The strategy for moving from the fundamental requirement set to an operational system is shown in Figure 1. First, the fundamental learning requirements are captured in the conceptual learning model. Second, the conceptual learning model is translated into a Learning Methodology (LM) process model, which is used to develop the user specific application; in this case Objective Based Training (OBT) [12]. Third, OBT guides the development of the system architecture and design specifications. During system design, technology is introduced and integrated based on both engineering performance and how it supports the learning process.

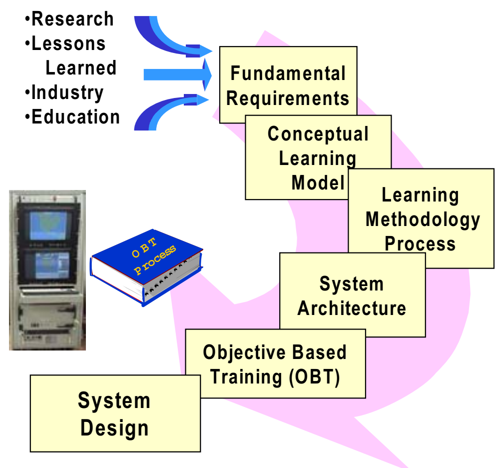

Figure 1. Learning Requirements Drive the Operational System.

The following provides examples of inputs from industry, education, research, operational lessons learned and team dynamics that were used to develop the set of fundamental learning requirements, which in turn were used to build Conceptual Learning Model.

Industry

Michael Marquardt, in Building the Learning Organization, provides specific characteristics for "new learning": (1) Performance-based, tied to objectives, (2) Importance of learning processes (learning how to learn), (3) Critical thinking, (4) Address knowledge, skills, and attitudes, (5) Product of the activity, context, and culture in which it is developed and used, (6) People help create, (7) Critical survival skill, (8) Continuous learning, (9) Facilitators help people think critically, (10) Accommodate and challenge different learning style preferences, and, (11) Part of work—part of everyone's job description [13].

Research

Research conducted by Massachusetts Institute of Technology (MIT) theorists Jay Forrester, Donald Schon, Chris Argyris, and Peter Senge provides insight into effective teams and the requirement for the system approach, critical thinking, and the reflective process. In general, they set the requirement for developing cognitive teams with critical thinking competency [14].

Research conducted by Naval Air Warfare Center, Training System Division (NAWC TSD) on the Tactical Decision Making Under Stress (TADMUS) project investigated the ways a team makes decisions and collectively learns. Their research also defined learning processes, and measurable team skill dimensions: leadership, communication, supporting behavior and information exchange [15].

Education

As part of his indictment of the US educational system, Lewis Perelman advocated moving from the traditional educating forum (the schoolhouse) to a contextual environment "smart space" that represents the occupational field chosen by the student. Through problem solving and reflective thinking within these contextual spaces, the student acquires knowledge and skills directly applicable to their chosen occupation. With immersion contextual learning, Perelman reported that four times as much information could be learned in half the time as compared to traditional training/educational methods [16]. As part of TADMUS and related studies, NAWC TSD found that 30% less mastery time was required and a 50% improved performance was observed [17].

Lord's research found that close collaborative support in co-operative learning situations can create excitement within teams, building trust, honesty, openness and empathic support as members of a team develop greater knowledge and appreciation of all the necessary tasks to meet the goal. Collaboration is more than just working co-operatively, it is a synchronicity that builds within a team where trust and support encourage members to explore, take risks and expand the possibilities. The collaborative bond, which develops in a team, helps to overcome the fears and anxieties; the mutual respect and interdependency built encourages people to speak out and make a difference [18].

Lessons Learned

In Hope Is Not a Method (1996), General Gordon Sullivan, former Army Chief of Staff, provides a wealth of lessons learned and how prepared the Army for the 21st Century. There is one quote that should be chipped in stone:

> "The most important tool a leader uses is not a list of rules but a mind sharpened by the habit of reflection. We use three questions: What is happening? What is not happening? How can I influence the situation? Taking time to reflect is one of the hardest habits to cultivate…. Take time to reflect, to put things in perspective [19]."

Team Dynamics

A true team (where the whole acts for the good of the team as a single entity) is very different from individuals (with unfocused and undefined goals) performing as part of a 'team'. In a "team", members are active participants in analysis of their performance, setting goals, decision making and communicating concerns and actively integrating new ways of operating into the team's performance.

The concept of operating as a 'team' rather than working in teams is not an add-on notion; rather it is a fully integrated way of operating, requiring fundamental changes. As stated by Katzenbaach and Smith, (1994):

> "…in any situation requiring the real-time combination of multiple skills, experiences and judgement, a team inevitably gets better results than a collective of individuals operating within confined job roles and responsibilities" [20].

In development of an effective team training capability, team dynamics must be considered along with system functionality. Two team dynamic parameters considered critical are: Team Formation/ Maturation, and Team Stress.

Team Formation/Maturation: The team formation and maturation process as shown in Figure 2 illustrates the sequence that a team goes through developing the collective task and team skills required to attain the Master Team status. In general, team formation and maturation requires repeated opportunities to work together on meaningful problems that require collective team problem solving. Cohesive team development does not happen over night nor do teams maintain competencies without continued practice [21].

A facilitating function is critical for efficient, effective team building. According to Peter Senge, (1990), "when people in organizations focus only on their position, they have little sense of responsibility for the results produced when all positions interact." [22] It is important that the individuals are also able to see the organization as a whole and to see their part – their role and interaction within the organization. Individuals need to learn how to 'ride the waves', to find ways to navigate the change; working as a team is one mechanism, which encourages and supports

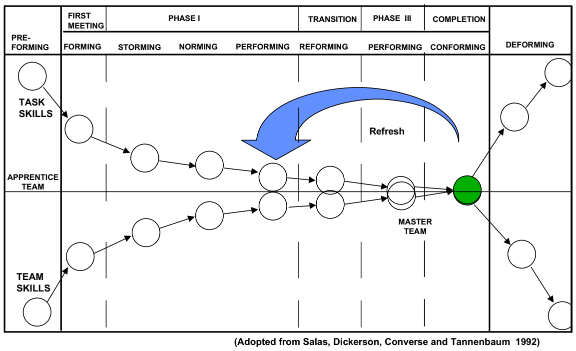

Figure 2. Team Formation and Maturation Process

learning, and delivers benefits to the organization with a committed, learning workforce. To undertake new learning alone is an onerous task, and one that will be constrained by life's experiences and the perceived limitation of that individual. To work collaboratively as a team, opens more opportunities, builds the knowledge base through knowledge sharing, and adds value to the organization with a solution focused approach [23].

Team Stress/Performance: Teams are most effective when they have challenging work that fits within their perceived collective capabilities. An effective team operates within what is referred to as the *zone of curiosity*. If the task at hand is mundane, the team/individuals will lose interest and motivation with a decrease in performance. If the task is perceived as being so difficult due to uncertainty or complexity as to be unachievable, stress across the team increases to a point where performance also falls off (See Figure 3). Team performance can be improved through graduated cyclic training that incrementally increases the level of complexity. Through monitoring of team performance and changing the environment accordingly, a facilitator can adjust the team's operating zone. They can slide the operating zone along the complexity axis and let the team adapt to the new environment by situation awareness and practice thereby lowering individual/team stress levels with an increase in performance.

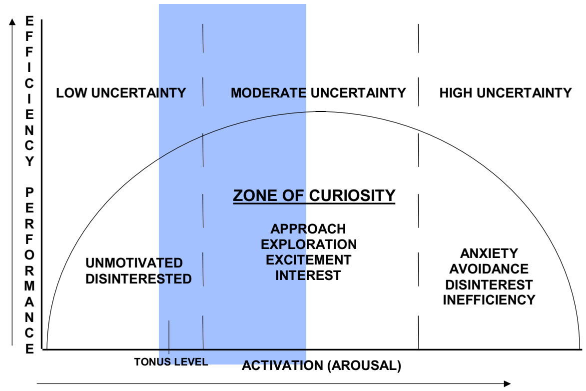

Figure 3. Team Performance vs Uncertainty (Stress)

Fundamental Requirement Summary

In summary, the following includes a summary set of fundamental team learning requirements, which must:

- Be focused with objectives
- Be realistic and challenging
- Support team building,
- Be contextual and relevant,
- Be flexible,
- Included reflective process,
- Address task and team skills,
- Address stress adaptation,
- Be non-intrusive,
- Be viewed as a continuous function,
- Include qualified, effective facilitation,
- Integrate collective critical thinking,
- Support movement to knowledge management,
- Be adaptable for training and testing,
- Become the foundation for readiness and knowledge management.

CONCEPTUAL LEARNING MODEL

The conceptual learning model provides a framework, to collect and assemble the basic building blocks that address the fundamental requirements for establishing an effective and efficient team-learning environment. Collective development of the model by users, developers, sponsors and subject matter experts is critical to building a shared vision and the success of the follow-on system development process. This promotes 'community buy-in' and starts the cultural changes required for successful deployment of the final system.

The following describes the conceptual learning model. It is based on a collective joint effort] and addresses most of the fundamental learning system requirements. The model supports the aggregate objectives:

- Task Competency Development,
- Team Skill Maturation,
- Critical Thinking Practice,
- Stress Adaptability,
- Performance Measurement,
- Readiness Enhancement,
- Knowledge Management Support.

Conceptual Learning Model: System Perspective

From a system perspective, the learning model is composed of three interrelated parts: Planning, Demonstration and Debrief (After Action Review). As shown in Figure 4, the three parts have an overarching facilitating function that supports the team through monitoring, evaluating, guiding and counseling.

In general, the system model operates across the three parts/phases as follows:

Planning:

- Team and facilitator select training objectives and complexity,
- Facilitator builds scenario, and
- Team and facilitator review training event and learning process.

Demonstration:

- Facilitator conducts training event,
- Team is immersed into environment,
- Team is presented with situational problems that require collective effort
- Team 'experiments' with current competencies to address the problems,
- Data is collected on ground truth (what was presented to the team) and performance (what the team did), and
- Facilitator monitors team performance and adjusts environment accordingly.

Debrief:

- In a timely manner, the team assisted by the Facilitator reflects on the training event and through dialogue challenges not only what they did but also how they did it.
- Relevant debrief product are provided to aid the team in developing situational awareness and assessing their performance.
- As the team collectively conducts critical thinking and change perceptions, they mature as a team and develop task competencies, and,
- At the conclusion of the training evolution the team reassesses their task and team performance levels and set a new baseline.

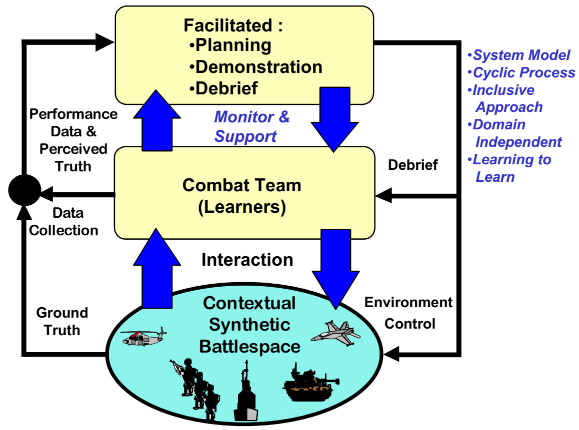

Figure 4. Conceptual Learning Model: As a System

From a complex system perspective, the learner must be considered as a part of the system and, therefore, for maximum effectiveness, the learner must be co-oped into becoming an active participant in the learning process. To achieve this objective, the learner's awareness relative to the learning opportunity and how he/she can enhance the process must be continually reinforced and facilitated by the process. Senge postulates that by repeated cycles in a structured learning process, participants become better learners - they learn how to learn [24]. Throughout the discussion of the model and follow-on processes, a key element to success of the combat system team learning experience is the support of facilitator function. There must be a concerted effort to 'train the trainers' in this critical skill.

The model's cyclic component enables teams to incrementally develop desired task and team competency through conducting repeated learning cycles and maintain competency levels through conducting refresh cycles. The model incorporates the concepts of contextual, immersion learning that have proven to accelerate the learning process by increasing what is learned while reducing the time required to learn it.

Following the principle that to improve a process, you must be able to measure it, the model provides for collecting ground truth, team performance data and the ability through debrief products to compare performance data to standards. This provides the team with a 'yardstick' to determine where they are and how they progress toward set objectives. It also provides a built-in mechanism, which measures the effectiveness of the learning system/process. The Debrief process is modeled after the collective work of Donald Schon, Chris Argyris, and Peter Senge. Also, an underlying objective of Debrief is to move from the 'old training exclusion mentality' (where you identify the 'good guys' and get rid of the 'bad guys') to an inclusion strategy that follows the Master-Apprentice metaphor. This metaphor involves using a shared experience followed by open dialogue and intellectual exchange in which the Master mentors the Apprentices. The end result being a 'Master team' and a 'team of Masters.' Burns states:

> "being competent means having the ability to manage the tasks and challenges that life delivers. We can no longer train people for a single skill but must rather give them the 'learning' foundations on which they can develop further training and education again and again in the course of a lifetime [25]."

Although, the focus of this paper is training and learning, it can be readily seen how the model with minor word changes could be adapted for testing and used to determine system operability/interoperability. Additionally, if the data collection element is used during tactical operations for acquiring performance data the debrief element produces relevant, timely products using this data, hence, the model could represent an operational assessment aid. Finally, if the task and team information came from a central repository and performance information was provided back to the repository, the model can be adapted to a knowledge management system.

Conceptual Learning Model: Planning Phase

This section will discuss the Planning part of the Conceptual Learning Model. In the planning phase as shown in Figure 5, the facilitator and the team collectively work together to layout the training event. First, they determine their proficiency baseline (where they are), and where they want to be after completing the training event. As an element of determining where they are, the team reviews their team skill and task skill competency levels individually and as a team. Next, the team considers what task and team skill objectives are to be considered during the training evolution and the environment in which they are to demonstrate the desired competencies. Based on these discussions, the facilitator assembles a scenario that sets the contextual environment at the appropriate complexity. The contextual environment will include multiple objective-driven learning opportunities (situational problems), with varying degrees of difficulty that the team must collectively work together to achieve successful results. After assembling the scenario, the facilitator reviews the planned event with the team to ensure that the proposed scenario meets the team's expectations. This also insures that team continues active involvement in the learning process at every stage. To ensure that the team must demonstrate critical thinking (problem solving) skills, details of the scenario are <u>not</u> shared with the team.

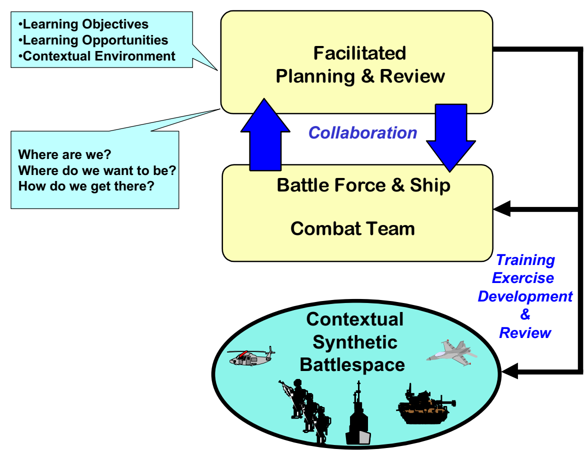

Figure 5. Conceptual Learning Model: Planning and Review Phase

Conceptual Learning Model: Demonstration Phase

During the Demonstration phase as shown in Figure 6, the team is immersed into an interactive *Contextual Synthetic Battlespace* where they are presented with situations that require collective competencies (knowledge and the skill to use that knowledge) to be successful in meeting the mission/training objectives. This is where the team demonstrates what they know in a contextual environment.

As the team encounters the learning opportunities and demonstrates their collective critical thinking skills, ground truth and performance truth data are collected and stored in a non-intrusive manner. *Ground Truth* data reflects what was presented to the team, and *Performance* data represents what the team believes was presented to them. Selection of team performance data is based on validated and accepted Measures of Performance (MOP) and Measures of Effectiveness (MOE) metrics. MOP and MOE are applicable to both task and team skills. The facilitator monitors team performance and adjusts the environment by increasing or decreasing the scenario complexity and difficulty to maintain the team's zone of curiosity.

Conceptual Learning Model: Debrief Phase

This section discusses the Debrief part of the Conceptual Learning model as shown in figure 7. Within a timely manner, the team -as a team- must be able to project themselves back into the training demonstration environment and both individually and collectively reflect on what happened. Although the definition of "timely" may vary dependent on the

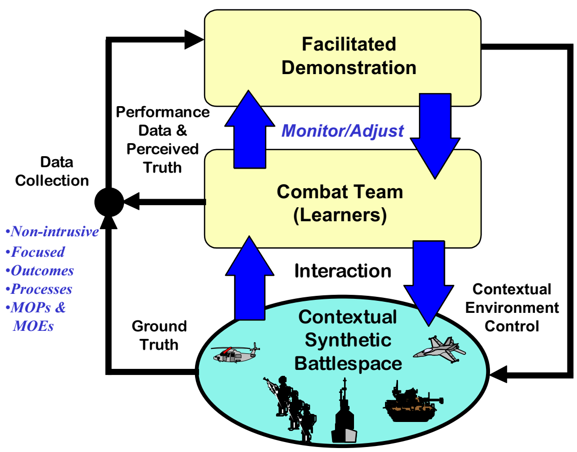

Figure 6. Conceptual Learning Model: Demonstration Phase

team and the specific learning objectives, US Navy shipboard team evolutions require debrief be initiated within 15 minutes of completing a one-hour scenario to maximize learning benefits. In the debrief phase, the team asks three questions: What happened? What should have happened? What can we do to influence it?

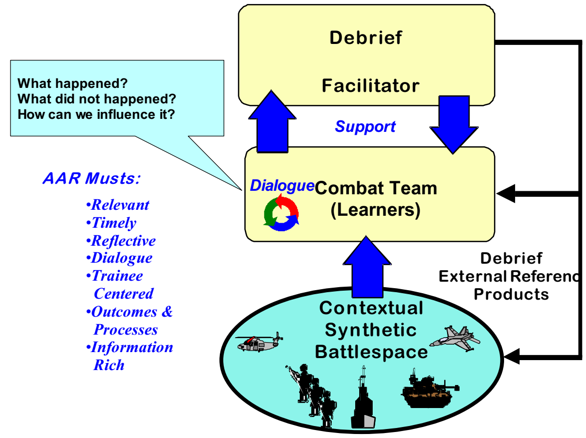

Figure 7. Conceptual Learning Methodology: Debrief Phase

Through the debrief process, the team challenges their perceptions and performance from an outcome and a process viewpoint. (Evaluating their actions not only on doing the right thing but also doing it in the right way). The job of the facilitator is to help the team address the three questions by engaging in focused dialogue supported by external references. External references are relevant products that aid the team in changing collective and individual perception in effect – to learn.

In summary, to be effective, the debrief products must:

- Be available in a timely manner,
- Be based on validated MOPs and MOEs,
- Be relevant to the operators and decision makers,
- Accommodate diverse learning styles,
- Measure outcomes and process against standards,
- Support team dialogue,
- Include ground and performance information,
- Be flexible and adaptable.

The dialogue, which is conducted around debrief products, is significant and serves two purposes. First it provides an effective process for determining that the team and individuals are learning and, second, through the dialogue process the master team members mentor the apprentice team members. Situational awareness is raised for both the team and individuals. They can visualize how each team member and the team as a whole contributes to overall mission success. After completing Debrief, the facilitator helps the team reassess and record where they are (competency baseline); this sets the performance and complexity bar for the next learning cycle.

LEARNING METHODOLOGY

Learning Methodology (LM) process model (here after referred to as LM process and as used in this paper) is defined as the operational translation of the conceptual learning model into a form that more closely reflects the user application. The LM process provides an initial input to the system development and logistical support process. This includes aiding in definition of system architecture and developing lifecycle support documentation. The LM process also provides a means of describing the learning environment in terms that support meaningful dialogue across the user, developer, research, cross service, joint and coalition communities that fosters developing a shared vision and raising learning awareness. This is considered a crucial step in the transitioning from theory to practice. The LM process as shown in Figure 8 was developed as part of a collaborative Joint and Multi-service working group supported by the user, engineering and behavioral science communities. The LM process reflects both their shared conceptual learning model vision and experience with simulation based training systems. As a result, this process model thus represents the fusion of learning theories and practical experience in joint and service component training environments.

As in the Conceptual Learning Model, the LM process reflects three basic phases: Planning, Demonstration and Assessment. These three parts are comparable to the three conceptual learning model phases. The three LM parts are further broken down into the following steps:

***Planning*:**

- Review Team Skill Inventory,
- Selection Training Task ,
- Select Team Member focus (Watch Stations),
- Define Learning Objectives,
- Assemble Scenario, and
- Pre-Brief Learning Event.

Demonstration:

- Conduct Scenario, and
- Collect Ground Truth & Performance Data.

Assessment:

- Conduct Analysis & Produce Feedback Products,
- Conduct Facilitated Debrief ,
- Assessment Team & Individual
- Performance, and
- Update skill Inventory.

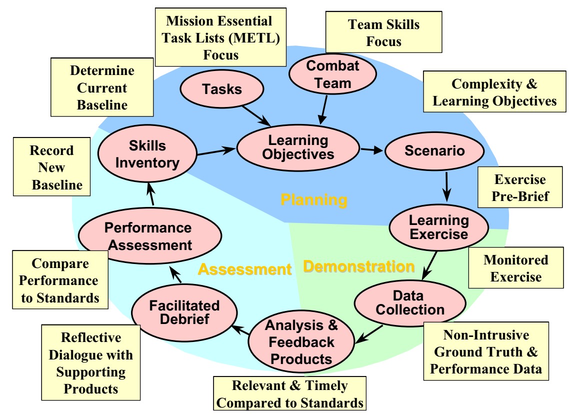

Figure 8. Learning Methodology Process Model

SYSTEM ARCHITECTURE AND DESIGN

A generic shipboard BFTT system diagram is presented in figure 9. The diagram provides an overall view of the architecture and the system components. The architecture and the components are traceable to the learning models and Objective Based Training processes: Planning, Demonstration and Assessment. The following provides the linkage between the learning requirements and the BFTT system:

- ***Common Synthetic Training Battle Space Local Area Network (LAN):*** Creates a reservoir of the overall contextual environment,
- ***BFTT Console*:** Supports Scenario Generation, Exercise Pre-brief, Scenario Control, Data Analysis, Product Generation, and Debrief Product Control;
- ***Navigation Simulation*:** Creates Contextual Environment (moves the ship electronically to operating area),
- ***Land Access Units & On-board Trainers (OBT):*** Creates the contextual mission space and tailors entities to tactical system capabilities,
- ***Trainer Stimulator/Simulator System (TSSS):*** Creates Contextual Environment for Search and Fire Control Radars by

injecting composite RF or IF signals into radars,

- ***Missile System OBT:*** Injects ship generated interactive missile entities into the contextual reservoir,
- ***Damage Control Trainer:*** Integrates DC and Combat System Training,
- ***Data Collection Modules:*** Non-intrusively collects Ground Truth and Performance Data,
- ***Displays and Printers:*** Display Debrief Dynamic Re-play and print hard copy products.
- ***Encryption Device:*** Provides security for ship and exercise information,
- ***Training Data Link (TDL)*****:** provides connectivity between participants to share contextual environment and performance data. (Note: Using the Training Data Link is "how" we connect HMAS WATSON, see below)

As technology is integrated into the system, it is evaluated relative to supporting the learning requirements set forth in these conceptual and process models. BFTT functionality will be demonstrated at I/ITSEC 2001 locally and to HMS WATSON, Sidney, Australia (Royal Australian Navy's shore training facility) [26].

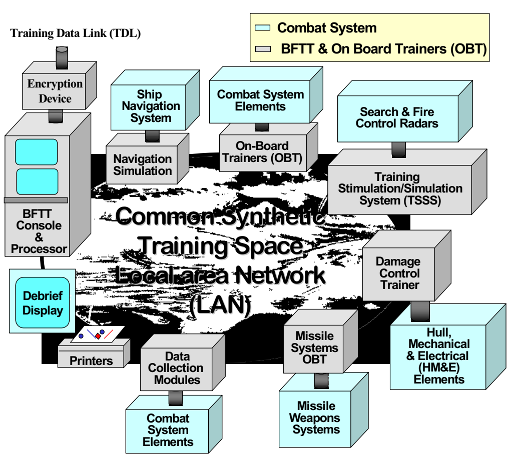

Figure 9. BFTT Architecture and Functional Design

Objective Based Training (OBT)

US Navy further refined the LM process and designated as the Objective Based Training (OBT) process that has been instituted throughout the US Fleet. OBT provided the linkage between the movement to learner centric training and the specific US Naval user requirement [27]. OBT will incorporate:

- Navy Essential Task List (NETL) as the top reference for all team tasks,
- Linkages between NETL and training objectives,
- Measures of Performance (MOP) and Measure of Effectiveness (MOE) for defined tasks,
- Scenario Generation linked to Learning Objectives,
- Data Collection linked to MOPs and MOEs,
- Standards for each MOP & MOE,
- Training objectives and data collection linkage to debrief products,
- Debrief products linked to watch stations, warfare areas, ships and battle groups, and
- Ability to store and retrieve individual and team performance information.

Currently, the BFTT has implemented a basic LM process. There is a significant planned product improvement underway for the BFTT System to fully integrate and automate the OBT process, which is being accomplished under the Afloat Training Exercise and Management System (ATEAMS) project. ATEAMS provides for the integration and automation of OBT into BFTT and will be accomplished in a three-phased approach:
Phase 1: ATEAMS Stand Alone
Phase 2: ATEAMS interfaced to BFTT
Phase 3: BFTT - OBT Integration

A detailed description of OBT and ATEAMS can be found in I/ITSEC 2001 paper; *Objective Based Training and the Battle Force Tactical Training System; Focusing our Fleet Training Processes* [28]. The BFTT System and OBT process will be demonstrated in the NAVSEA, PMTA I/ITSEC 2001 booth.

SUMMARY

In summary, the BFTT Program Office found the up-front process of building Learning Models to be very beneficial in producing a system that can adapt to the Fleet training need in the 21st Century and beyond. But more importantly, integrating and automating Objective Based Training into the BFTT system provides the Fleet with a performance based, on-demand, team learning environment in which Combat Teams demonstrate what they know within a mission contextual environment. This provides the Warfighter with the required tools and metrics to give an educated and validated response to the question: ***Are we Ready*?**

REFERENCES

1. Morriss, R,. Lavery, B., & Deuchar. (1995). Nelson, An Illustrated History. National Maritime Museum, Greenwich

2. Alberts, D, Garska, J., Stein. F., (1999). Network Centric Warfare. CCRP Publication Series, Wash DC.

3. US Joint Chiefs of Staff. (2001). Joint Vision 2020.

4. Fullan, M, G. (1991). The New Mean of Educational Change. London. Cassell.

5. US Chief of Naval Operations (CNO). (1990). Tactical Training Strategy (TTS) Report. CNO, Wash DC.

6. Fenty, Dr. L., Brewer, J., Burke, M., O'Neal, M. Patton, D. & Simpson, H., (1999). Learning Methodology Reference Document. NAVSEA, PMS430. Wash DC.

7. Brewer, James D., (1986, December). "Test, Training, and Performance Monitoring (TT&PM) Study". US Naval Weapons Engineering Station, Port Hueneme,CA.

8. Chief of Naval Operations, (CNO), (May, 1991). US Navy, message 051905Z.

9. BFTT Program Management Plan (1993) NAVSEA BFTT Program Office, Wash DC.

10. Fenty (1999), Learning Methodology Reference Document.

11. Clark, P., Zalcman, L., Ryan, P. Beasley, D., O'Neal, M., & Brewer, J. (2001). Building Towards Coalition Warfighter Training. DSTO. Melbourne AU.

12. Acton, B., & Stevens, B. J. (2001). Objective Based Training and the Battle Force Tactical Training System; Focusing our Fleet Training Processes. I/ITSEC. Orlando. FL.

13. Marquardt, Dr. M. (1996). Building the Learning Organization. New York. McGraw-Hill.

14. Senge, P. M. (1990). The Fifth Discipline. The Art and Practice of the Learning Organization. Doubleday/Currency. New York.

15. Cannon-Bowers, J., & Salas, E. (1998). Making Decisions Under Stress; Implications for Individual and Team Training. NAWC TSD, Orlando FL.

16. Perelman, L. J., (1992). School's Out: Re-learning, the New Technology, and the End of Education. New York: William Morrow & Company, Inc.

17. Cannon-Bowers, J., & Salas, E. (1998).

18. Lord, T., (2000). From Teaching To Learning.

19. Sullivan General G., & Harper, M., (1996). Hope is not a Method. Times Books, New York.

20. Katzenbach, J., & Smith, D. K. (1994). The Wisdom of Teams. Creating High Performance Organizations. New York. Harper Business.

21. JV2020 (2001).

22. Senge, P. M. (1990).

23. Fenty, Dr. L., Brewer, J., Burke, M., O'Neal, M. Patton, D. & Simpson, H., (1999).

24. Senge, P. M. (1990).

25. Burns, R. (1995). The Adult Learner at Work. Sydney. Business & Publishing.

26. Clark, P., Zalcman, L., & Ryan, P. (2001)

27. O'Neal, M. & Davis, W. (April 2001). The Fleet Needs Integrated Systems and Training. Naval Institute Proceedings. Annapolis, MD, (89-91)

28. Acton, B., & Stevens, B. J. (2001) .